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From (5)+(7), $2am^2n^2-9bn^4-2abn^2=ab^2+a^2b$ ....(9).

Subtracting (9) from (8), $2abn^2=2ab(b-a)$. Whence $b-a=n^2$.

Factoring (8), $n^2(2am^2-3bn^2)=ab(b-a)$. Whence $2am^2-3bn^2=ab$.

Put $2a=n$ and by easy reduction we have $2m^2=b(6n+1)$. Since $\frac{1}{2}(6n+1)$ cannot be a square $b/2$ must be a square to make an integral. Then $m^2=b/2(6n+1)$ is $(n^2+\frac{1}{2}n)/2\times(6n+1)$. $n=4$ being the only value that will make both factors a square, $m=\sqrt{[(n^2+\frac{1}{2}n)/2]}\times\sqrt{(6n+1)}=15$.

$\therefore$ $x=241$, $y=269$, $z=149$, $p=329$, $q=89$, $r=191$.

PROBLEMS FOR SOLUTION.

ARITHMETIC.

106. Proposed by ELMER SCHUYLER, High Bridge, N. J.

What is the amount of $1000 at compound interest for 3 years at 6%, if it be compounded every instant?

107. Proposed by R. V. ALLEN, Hooker Station, Ohio.

A barn, $ABCD$, length $AB=b$ feet, width $AD=a$ feet, standing in an open field, has a horse tethered to a point, P, in the side, AB, distance $AP=c$ feet, with a rope R feet long. Over what area can the horse graze?

⁂ Solutions of these problems should be sent to B. F. Finkel, not later than March 10.

ALGEBRA.

94. Proposed by J. W. YOUNG, Columbus, Ohio.

Solve : $\left[\dfrac{x^2+14x+1}{p^4+14p^2+1}\right]^3=\dfrac{x(x-1)^4}{p^2(p^2-1)^4}$.

Burnside and Panton's *Theory of Equations*, page 148, ex. 17.

95. Proposed by SYLVESTER ROBINS, North Branch Depot, N. J.

Substitute *numbers* in place of the letters in the following pattern: ......$\triangle=\sqrt{81^2a^2b^2c^2}=81abc$..... b^2+c^2, a^2+c^2, a^2+b^2; and compute the areas and sides of the whole nest of integral, rational triangles.

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GEOMETRY.

114. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy, Ohio State University, Athens, Ohio.

If a variable ellipse hyperosculate a fixed ellipse at the extremity of the minor axis, the locus of the foci is a circle whose diameter is equal to the radius of curvature.

115. **Proposed by MARY BLAINE, B. Sc., Graduate Student, Drury College, Springfield, Mo.**

The locus of a point such that the sum of the squares of its normals form a given ellipsoid is constant, is a co-axial ellipsoid. [From *C. Smith's Solid Analytical Geometry*, page 95.]

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CALCULUS.

85. **Proposed by J. SCHEFFER, A. M., Hagerstown, Md.**

A line of double curvature, beginning at some point in the circumference of the base circle of a right cone, winds itself under the constant inclination β to the base circle around the curved surface of the cone. Find its length and that of its projection upon the base circle.

86. **Proposed by WALTER H. DRANE, Graduate Student, Harvard University, 65 Hammond Street, Cambridge, Mass.**

Prove that the curve whose normal equals its radius of curvature drawn in an opposite direction, is the catenary, $y=c\cosh(x/c)$.

87. **Proposed by MARY BLAINE, B. Sc., Graduate Student, Drury College, Springfield, Mo.**

Integrate $(px-y)(py+x)=h^2p$, where $p=dy/dx$.

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MECHANICS.

82. **Proposed by WALTER H. DRANE, Graduate Student, Harvard University, 65 Hammond Street, Cambridge, Mass.**

A sphere, diameter $2a$, rests in limiting equilibrium upon the edge of a box and against a vertical wall. If the box be of such dimensions that it will not tip, find the distance of the box from the wall, having given the coefficient of friction between the sphere and wall $\frac{1}{2}$, between the sphere and box $\frac{1}{3}$, and between the box and floor $\frac{2}{3}$. [From Problems in Mechanics proposed to class in Harvard University.]

83. **Proposed by MARY BLAINE, B. Sc., Graduate Student, Drury College, Springfield, Mo.**

A particle is projected upwards in vacuo with a velocity v. Show that on reaching the ground again there is no deviation to the south, but the deviation to the west is $4\omega\cos\lambda(v^3/3g^2)$. [*Laplace*, iv, page 341.]

*** Solutions of these problems should be sent to B. F. Finkel, not later than March 10.

DIOPHANTINE ANALYSIS.

78. **Proposed by COOPER D. SCHMITT, A. M., Professor of Mathematics, University of Tennessee, Knoxville, Tenn.**

Find three square numbers in harmonical progression.

79. **Proposed by EDMUND FISH, Hillsboro, Ill.**

Find an integral right triangle in which the bisector of one of the acute angles is also integral.

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